AquaHealth OnLine: A New Learning Environment for Capacity Building in Aquatic Animal Health

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Abstract

Due to significant requirement of trained personnel in Fish Health Management, the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD) offered 14 sessions of face-to-face (F2F) training (1988–2002) at its station in Iloilo. However, shrinking fellowship and travel funds necessitated a shift in training paradigm. Thus, transformation of teaching materials used in F2F trainings resulted to AquaHealth Online, a team developed and electronically delivered course on Health Management in Aquaculture. The general objective of the course transformation was to train a large pool of geographically dispersed participants at minimum cost, and this paper reports on the experience earned in course development, delivery and outcome.

To enable Fish Health specialists to develop materials and skills to deliver courses for the online environment, SEAFDEC/AQD collaborated with the University of the Philippines Open University to help adapt, enhance, and reformulate materials in the F2F course for online delivery. The specialists underwent hours of training in "techno-pedagogy", or ways of transforming teaching activities into formats that could be understood even in our absence. The primary learning resource is a CD-ROM that provides interactive information with self-assessment questions. The course covers 12 modules in 4 units: I. Introduction to Fish Health Management; II. Infectious Diseases of Fish and Crustaceans; III. Non-Infectious Diseases; and IV. Disease Diagnosis, Prevention and Control. Learning enhancement and discussion occurs through internet-based Discussion Boards (DBs) presided over by module specialists. The DBs serve as media for asynchronous discussions and makes a permanent record of lessons learned. When first offered in 2002, AquaHealth Online had 25 enrollees from

10 countries. In 2003, there were 17 participants from 8 countries. Participants were led to "just-in" relevant information and encouraged to submit assignments from internet resources. This course is an example that a state-of-the-art online course can be as effective as F2F training.

Introduction

Training on specialized subjects in aquaculture such as marine fish hatchery, freshwater aquaculture, nutrition and feed development, aquaculture management course, and many others were offered every year to participants from SEAFDEC member countries with funding for fellowships and travel from the Government of Japan. Training course delivery was through face-to-face (F2F) lectures, field trips and hands-on laboratory exercises. The Fish Health Management Training Course (FHMTC) was offered for fourteen sessions and became one of the most sought-after and well-attended international classroom type training courses at the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD). This was due to the realization that no aquaculture venture would ever succeed without due consideration to proper health management practices and the emergence of serious infectious disease outbreaks from the late 1980s. While the demand for trained personnel in fish health management was sustained, SEAFDEC/AQD anticipated the worldwide trend of generalized reductions in the public funding of institutions, diminishing access to private and charitable donations (Abrioux, 2001) and the need to become more self-reliant in its course offerings. Thus, transformation of teaching materials used in F2F trainings resulted to a team developed and electronically delivered full course on Principles on Health Management in Aquaculture or AquaHealth Online. Elearning in the Philippines is relatively new and many requirements need to be in place to catch up with developments worldwide (Khanser, 2003).

Objectives of AquaHealth Online

AquaHealth Online is an elearning course targeting full-time working professionals. It enables learning to take place in different places, both physical and virtual. Through elearning, it is convenient and practical for a learner to acquire knowledge and skills in aquaculture health management at his own place and at his own time as long as a computer and an Internet access are made available to him to communicate with highly qualified teachers or with fellow learners. The general objective of the course was to ensure delivery of efficient training to a large pool of geographically dispersed participants at minimum cost. As with the F2F FHMTC, AquaHealth Online's goals remained the same wherein at the end of the course learners should be able to:

- RECOGNIZE diseased shrimps and fish;
- IDENTIFY the cause of the disease;
- EXPLAIN how a disease develops;

- APPLY preventive and control measures to lessen the risks posed by the disease;
- USE appropriate techniques for the preparation of samples for disease diagnosis.

The Course Transformation Process

The most effective learning, whether delivered as conventional F2F instruction or an elearning solution, is a result of careful planning and systematic design derived from the needs of the organization and its clients. In conceptualizing SEAFDEC/AQD's elearning courses, it was recognized that expertise in course transformation to elearning mode was generally lacking. Thus, collaboration with the University of the Philippines Open University (UPOU) and SEAFDEC/AQD was formalized through a Memorandum of Agreement whereby the former provided expertise and guidance needed in online course transformation. The project was spearheaded by the Training and Information Division with the cooperation of specialists and content experts from the Fish Health Section. An editor was assigned to see to it that course materials are expressed in a language suited for online delivery. UPOU provided expertise in instructional and graphic design. The team worked in a collaborative manner to develop the course, whereby specialists received constant support from the instructional designer to develop the course structure, create the course webpages, and package them in a CD-ROM.

A. The Fish Health Team

Twelve senior research staff of SEAFDEC/AQD contributed in the course development (Table 1). Seven have PhD degrees and majority have acted as lecturers in the F2F FHMTC. Put together, their work experiences total 210 man-years of research and teaching in fish health and related disciplines. During the conceptualization of AquaHealth Online, many specialists were hesitant and got intimidated in delivering courses online completely. Issues on pedagogy have surfaced, but the team from the UPOU gave the necessary motivation and technical help in transforming the pedagogy of F2F instruction into online instruction materials. The specialists underwent a restructuring process with the goal of better preparing them to effectively integrate technology into their teaching and developing courses that make extensive use of Web-based technologies. This transformational process was to preserve the constructionist learning environment (Davies and Carbonaro, 2000) of the traditional course while at the same time optimizing the course delivery mode to make it more accessible to a wider audience of students.

B. Source of Course Materials

The transformation from F2F to elearning was not very difficult since basic students' references had already been transformed from loose handouts

Table 1. The specialists from SEAFDEC Aquaculture Department who comprised the AquaHealth online development team

Staff	Specialization	Highest Degree
Jesus Manolo E. Almendras	Larval Physiology of Fish, Immunology	M.Sc.
Elena S. Catap	Immunology, Fish Histopathology	Ph.D.
Romeo D. Caturao	Applied Marine Ecology	M.Sc.
Erlinda R. Cruz-Lacierda	Parasitology, Fish Histopathology	Ph.D.
Rogelio Q. Gacutan	Phycology, Plant Pathology	M.Sc.
Yasuo Inui	Fish Physiology	Ph.D.
Eduardo M. Leaño	Mycology, Bacteriology	Ph.D.
Gilda D. Lio-Po	Virology, Bacteriology	Ph.D.
Gregoria E. Pagador	Histopathology	M.Sc.
Leobert D. de la Peña	Molecular Diagnostics, Bacteriology	Ph.D.
Celia R. Lavilla-Pitogo	Bacteriology, Shrimp Histopathology	Ph.D.
Eleonor A. Tendencia	Bacteriology	M.Sc.

to a well-illustrated textbook (Fig. 1) on Health Management in Aquaculture (Lio-Po, Lavilla and Cruz-Lacierda, 2001). The book has 187 pages, 11 chapters, and over 140 diagrams, tables, drawings and colored photographs to illustrate the principles. Instructional media had also been upgraded from 35 mm slides and transparencies to PowerPoint presentations and short film clips. The Fish Health Section team underwent hours of training in what we now know as "techno-pedagogy", or ways of transforming teaching activities into multimedia formats that could be understood even in our absence. Thus, after "teacher training", online course design, review of system's capabilities, and provision of platform for online interaction, development of materials for AquaHealth online commenced.

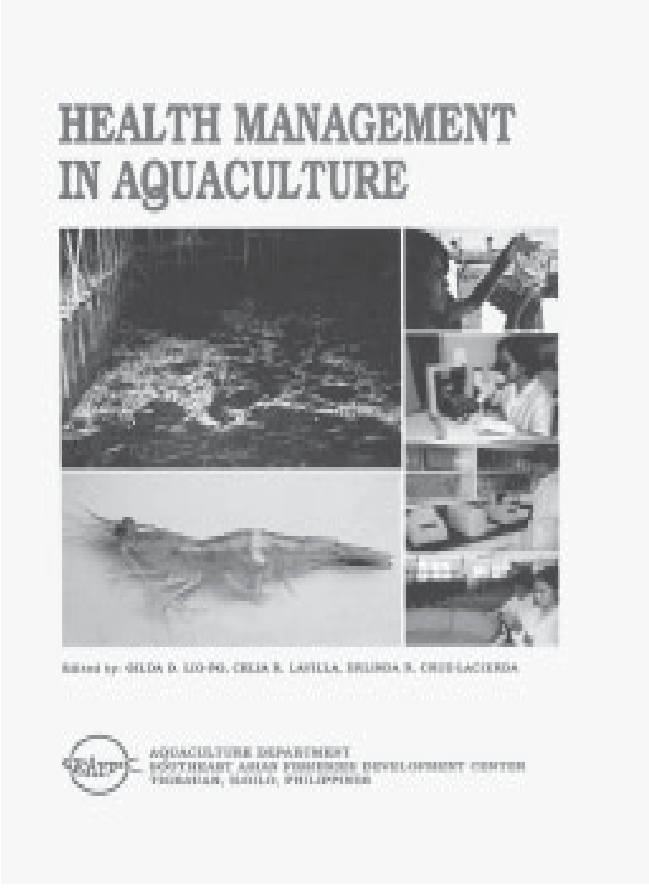

Fig. 1. The textbook on Health Management in Aquaculture edited by Lio-Po, Lavilla and Cruz-Lacierda (2001) that became the source of materials for the CD-ROM learning resource.

C. Course Design and Coverage

AquaHealth online covers up-to-date knowledge on fish and crustacean diseases, their causal organisms, and tried and tested methods of disease prevention and control. The course runs for a minimum of 16 weeks and is presented in 4 units consisting of 12 modules (Table 2). The duration of modules that deal with highly technical subjects was doubled allowing two weeks of discussion between the learners and the specialists.

The AquaHealth Online Learning Package

The advantage of an elearning package is that it not only provides a marriage of digital technology, Internet, and learning, but it also facilitates

Table 2. The units and modules of AquaHealth Online

Unit/Module	Title	Duration (weeks)
Unit 1	**Introduction to Fish Health Management**	
Module 1	Impact of Disease Development in Aquaculture	1
Unit 2	**Infectious Diseases of Fishes and Crustaceans**	
Module 2	Viral Disease	2
Module 3	Bacterial Diseases	1
Module 4	Fungal Diseases	1
Module 5	Parasitic Diseases and Pests	1
Unit 3	**Non-Infectious Diseases**	
Module 6	Nutritional Diseases	1
Module 7	Environmental and Other Non-Infectious Diseases	1
Module 8	Harmful and Toxic Algae	1
Unit 4	**Disease Diagnosis, Prevention and Control**	
Module 9	Histology as a Tool in Disease Diagnosis	1
Module 10	Serology and Molecular Techniques in Disease Diagnosis	2
Module 11	Immunity/Biological Methods of Disease Prevention/Control	2
Module 12	Physical/Chemical Methods of Disease Prevention/Control	1

learner-centered learning. The students are at the center of the teaching-learning process, and teachers act as mentors, navigators, facilitators, or "guides" to help the learners access, organize, construct, and transfer information to grasp the principles being imparted to them.

A. The AquaHealth Online CD-ROM

The FHMTC materials that were transformed into interesting and easily learned modules were rendered by the UPOU multimedia specialists and packaged in a CD-ROM "Principles of Health Management in Aquaculture" (Fig. 2). This software provides our learners with basic interactive information. Every module contains several interactive self-assessment-questions (SAQs) that help students gauge their learning progress. Formulation of SAQs took into account design guidelines formulated by Race (1997). Each of the 12 modules was authored by at least one specialist in the field. Recognizing that the key component in an elearning approach is the students' ability to obtain more information and research materials, online materials with hyperlinks to relevant websites were provided to encourage the learners to actively participate in the search for resources and answers to enhance their research and diagnostic skills.

B. Course Guide

A course guide (Fig. 3) was provided at the start of the course. The document provides the learner with the course basics: introduction, description, goals and objectives, outline, requirements (skills and equipment), manner of assessment (grading system), as well as activities for each chapter. Also in the document is a study schedule, instructions on navigating the CD-ROM, house rules and important contact numbers and addresses in case the learner needs rechnical support. Annexes are provided like Netiquette Guidelines, an introduction to the discussion platform in the Integrated Virtual Learning Environment (IVLE), starting discussions using the DBs, and submission of assignments and reports through the Workbin. The Course Guide also provides tips on how to become a successful online student and some frequently-asked-questions.

Fig. 2. The AquaHealth CD-ROM package containing the course modules that serves as offline learning resource

C. The Discussion Platform

Fig. 3. The AquaHealth Online course guide

The AquaHealth Online website used the IVLE structure hosted at the UPOU server (Fig. 4) and was accessible through links in the SEAFDEC/AQD or UPOU sites. The design of the course forum allowed discussion content to be accessible from any computer anywhere, as long as it was connected to the Internet with the user assigned account and password providing the gateway. The proposed structure consisted of a homepage with icons for establishing links to the course outline, schedule, content, email, discussion board, and technical support (Fig. 5). Interaction and exchange of ideas in each module was through the Discussions Boards (Fig. 6), each of which was mentored by at least one specialist. This set-up offered a semi-permanent record of what transpired during the module discussions.While absence in class is too conspicuous to ignore in face-to-face classrooms, an online student

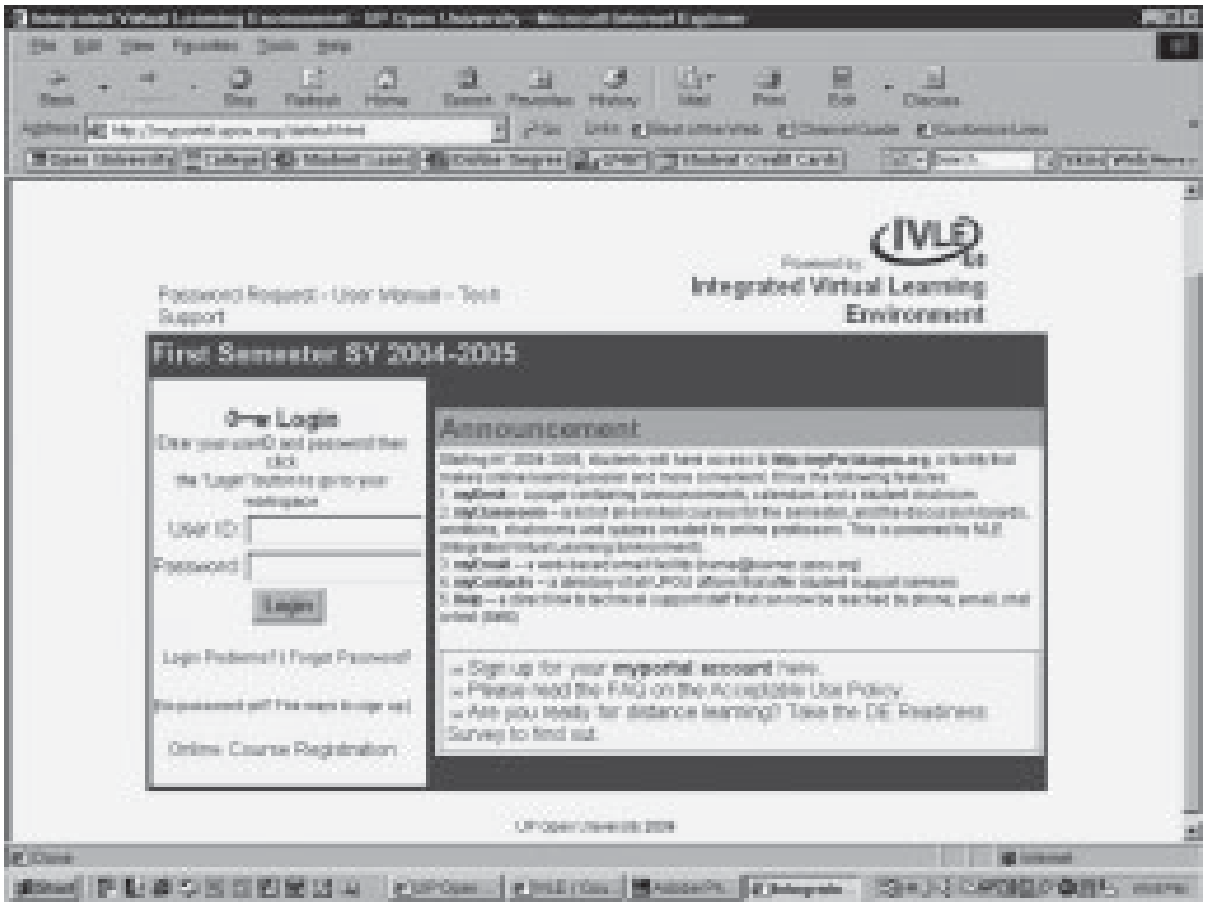

Fig. 4. The AquaHealth Online portal using the structure of the Integrated Virtual Learning Environment (IVLE)

always keeps tracks of discussion as long as the DBs remain posted. Asynchronous discussion and interaction through the DBs provide a permanent record of lessons learned as a result of interaction. Most importantly, the DB allowed for course material contents updates without necessarily revising the CD-ROM.

In addition to board postings, email was also used to inform learners about activities, grades, and reminders of upcoming deadlines and submissions. However, learners were not encouraged to use email as a platform for discussion in order not to disperse the sites where exchange of information is located. This is very important since discussion is asynchronous.class is too conspicuous to ignore in face-to-face classrooms, an online student always keeps tracks of discussion as long as the DBs remain posted. Asynchronous discussion and

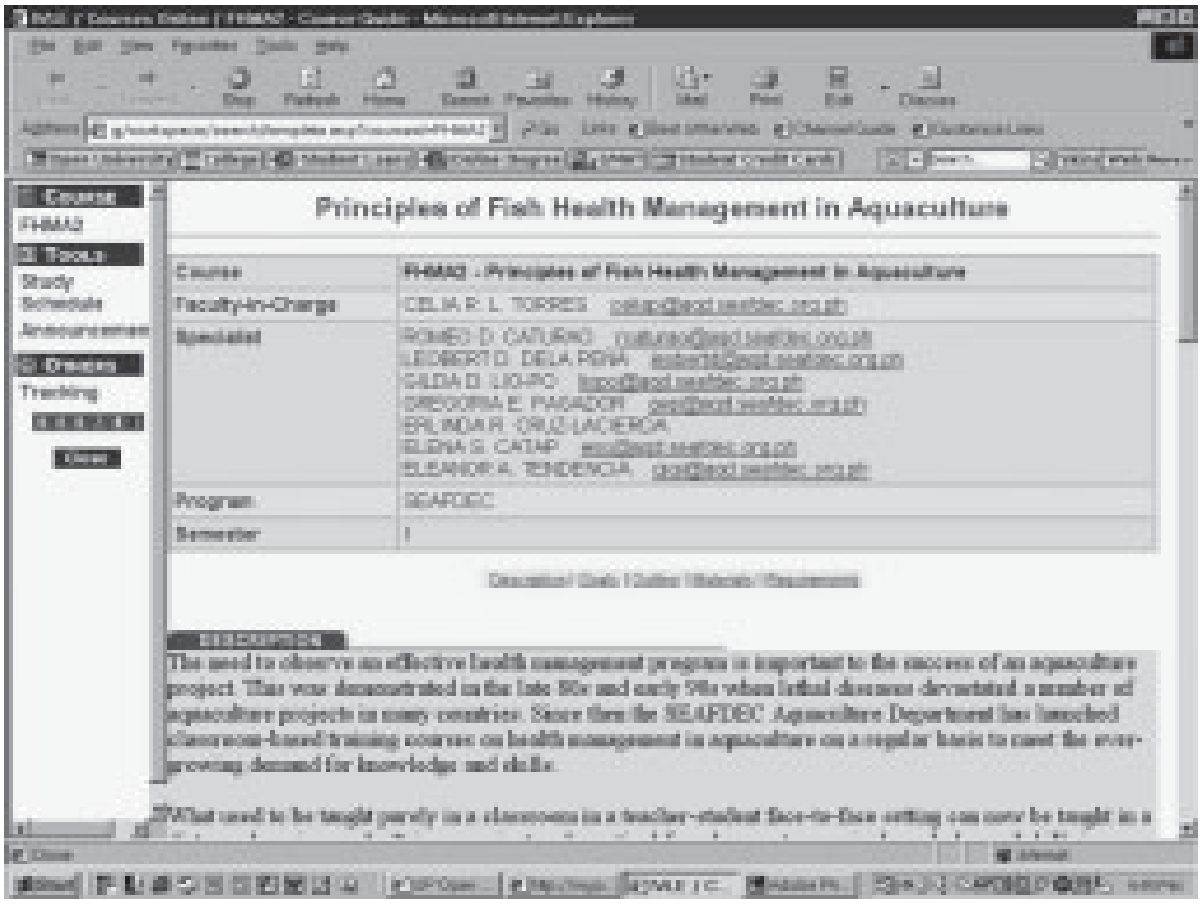

Fig. 5. The AquaHealth Online homepage

interaction through the DBs provide a permanent record of lessons learned as a result of interaction. Most importantly, the DB allowed for course material contents updates without necessarily revising the CD-ROM.

Recruitment of Trainees

When first offered in 2002, AquaHealth Online had 25 enrollees from 10 countries namely: Cambodia (2), Egypt (1), India (1), Indonesia (2), Malaysia

(2), Myanmar (2), Singapore (3), Thailand (2), Vietnam (3), and the Philippines (7). In 2003, there were 17 participants from 8 countries (Table 3). The Government of Japan provided fellowships for two participants each from 10 SEAFDEC member countries. They were nominated by their respective Directors to the SEAFDEC Council. Interestingly, 30% of

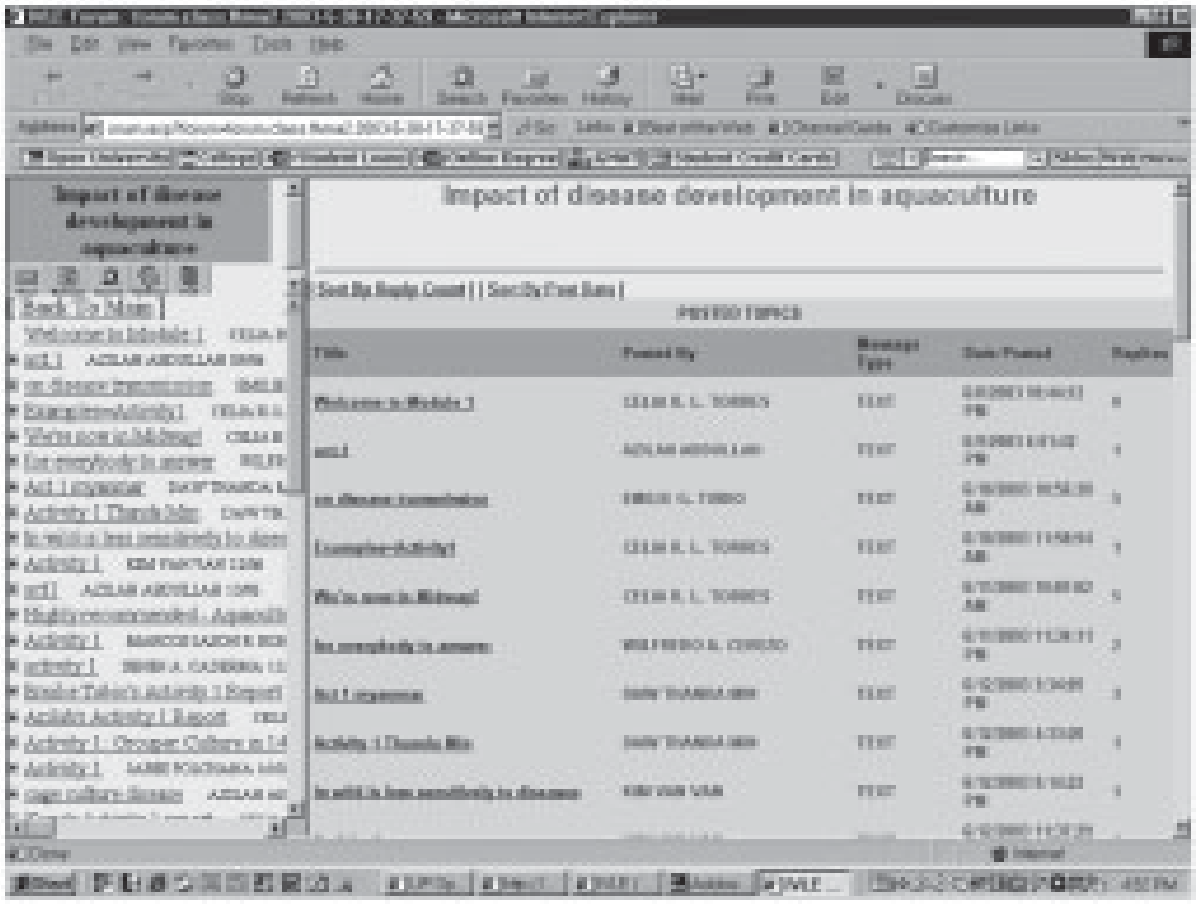

Fig. 6. The IVLE-based Discussion Board

participants in 2002 and 2003 are privately funded. The main requirement was that all learners must have taken a subject in college biology. The maximum number of learners at any time is set at 30. Overall, participants from 12 countries have participated in the course.

Conduct of the Course

Upon enrollment, learners were provided with User Identifications and Passwords that entitled them to enter the virtual classroom. Access to the virtual classroom was either through the SEAFDEC/AQD website at www.seafdec.org.ph of through UPOU's website at www.upou.org. Upon access to the course site, students "met" at the Café for Students where they introduced each other.

AquaHealth Online runs for 16 weeks where a designated specialist of a particular module encourages discussion and information exchange. A Course Officer moderates the whole process. Learners proceeded with the course as

Table 3. Profile of AquaHealth Online participants on its first two years of offering

	2002	2003
Total Number of Enrollees	25	17
GoJ* Fellowship	18	12
Private Funding	7	5
COUNTRY	**Number of Participants**	
Cambodia	**2**	**0**
Egypt	**1**	**0**
India	**1**	**0**
Indonesia	**2**	**2**
Malaysia	**2**	**3**
Myanmar	**2**	**2**
Oman	**0**	**1**
Philippines	**7**	**4**
Saudi Arabia	**0**	**1**
Singapore	**3**	**0**
Thailand	**2**	**2**
Vietnam	**3**	**2**
Age Range	20s to late 60s	20s to 40s
Male:Female	16:9	7:10

* Government of Japan

if they were in a classroom, except they face computer screens instead of instructors. Under the guidance of specialists, learners performed exercises individually or as a group and submitted reports of their work either through assigned workbins, by email or by posting them in the DBs for everyone's perusal. Group work was encouraged among learners from the same country to encourage F2F meetings, where possible. Most people learn better when computer-mediated lessons are combined with study groups, team exercises, and off-line events. Although computers can make aspects of learning more convenient, they do not eliminate the need for human intervention. In the first year, learners took examinations administered by proctors near the places of their work, but during last year's AquaHealth online, essay type or investigative take-home examinations were given. Of utmost importance was the unlimited interaction among learners, sharing insights and experiences, enhancing further the learning process.

Together with learning the principles of health management in aquaculture, AquaHealth learners enhanced their basic computer skills.

Learners found the interactive SAQs and tests in the CD engaging. Those who could not hold the mouse prior to the course, learned to access the IVLE website, took active part in the discussion forum, learned how to send and receive emails, type documents, attach files and submitted assignments through workbins. The links taught them how to access online dictionaries, abstracts of journals and interactive sites full of movie clips. Indirectly, the activities opened the gates to a wide array of online resources.

Out-of-"Classroom" Interaction

One problem with online learning is the perceived isolation of learners. Knowing that learning is a social experience, an Internet Café for AquaHealth learners was constructed where informal exchanges between them took place. This is where learners and specialists "meet" to learn more about each other, the nature of their work, to exchange pictures, and other personal contact that enhanced their interaction. One learner even sent a drawing depicting his interpretation of the on-going online course. While many learners and specialists keep in touch only during the course, a few remain in contact and arrange F2F meetings at every opportunity. Although "chat" was not used as a means of course delivery and discussion, it was used as a regular means of communication among learners.

Outcome of Courses

To evaluate the learners' performance, the following assessment criteria for AquaHealth online were adopted: examination and reports (60%), discussion board participation (20%), and learning activities (20%). The total point to be accumulated was 100%, and the passing mark is 70%. All participants of AquaHealth Online were working full time and have tight work schedules, and many would have been attending to their families' needs after work. Thus, participation and completion of requirements varied. Table 4 summarizes the performance of two batches of participants.

Learners who passed the course were awarded a "Certificate of Completion". Those who failed to get the passing mark of 70% but participated in the discussions were awarded "Certificate of Attendance". No recognition was given to enrollees who failed to participate significantly in the discussions and they were considered drop-outs.

Successful enrollees were those with high self-motivation. Although elearning course is accessible at learners' work place, home, cyber café, etc. some learners are unable to cope with the demands of the course concurrently with their normal workload and personal obligations. The required repeated use of resources like computers, floppy discs, printers, Internet connections, email and discussion forums to send, retrieve, and process information actually empowered rather than intimidated learners via the development of their computing skills. Absence of computer skills was less of a deterrent to learning that having no access to it at all.

Table 4. Outcome of AquaHealth Online courses for 2002 and 2003

	2002	2003
Total number of participants	**25**	**17**
Performance:		
Passed	**11 (44 %)**	**9 (53.0%)**
Failed	**11 (44%)**	**4 (23.5%)**
Dropped	**3 (12%)**	**4 (23.5%)**

Discussion

For SEAFDEC/AQD, online delivery of courses offers many benefits because it is cost-saving and course delivery through a CD with discussion through internet-based discussion boards drastically reduced or eliminated travel cost, thus decreasing per-student training expense. Online teaching also provides higher quality of interactive and flexible training using "just-in" materials available in the internet.

The students were very positive about the elearning format of Health Management in Aquaculture with many of them seeing it as superior to conventional classroom instruction because of the added benefit of honing computer and internet navigation skills. The CD-ROM also provides readily accessible module contents that can be translated in the learners' own language at their own pace. This positive impact on student learning is an outcome that most likely could not have been achieved through conventional training as has been observed by Oliver and Lake (1998).

Aware that attrition is a phenomenon that occurs at an alarming rate in an online learning environment, AquaHealth Online tried to provide interesting web-based links to capture the enthusiasm and interest of learners. The present state-of-the-art in online courses shows that the F2F teaching can even be surpassed by the online course pedagogy.

Looking Forward

It is a challenge to every good researcher to be able to reach an audience worldwide at a lesser cost. In ASEAN countries where many participants' command of English may become a deterrent to effective face-to-face learning, online learning is an effective tool since the learner can study the modules through the CDs offline at his own pace. As soon as he finds the need to interact online with his classmates worldwide, the 24x7 DB is there for asynchronous discussion.

Specialists from the Fish Health Section of SEAFDEC/AQD are already experiencing the fun and benefits of online interaction in virtual classrooms. Notwithstanding the difficulty in shifting to a new teaching (mentoring) paradigm, online teaching (and learning … yes, we do learn with our learners!) is a necessary shift that should be embraced by everyone.

The component of FHMTC that is obviously lacking in AquaHealth Online is hands-on activity, which comprised almost 70% of the F2F training. Thus, a mixture of both online and F2F modes is being planned for the coming year. Learners who pass AquaHealth Online will be invited to SEAFDEC/AQD to undergo specialized hands-on training that will enhance their capability to perform disease diagnostic work. For more information about the course, please visit: http://www.seafdec.org.ph/training/aquahealthonline.html

Acknowledgements

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